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DESCRIPTION
INFORMATION PROCESSING APPARATUS AND
CONNECTION CONTROL METHOD

5 TECHNICAL FIELD

The present invention relates to a technique of wirelessly connecting an information processing apparatus to other information processing apparatuses in a plurality of wireless networks.

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BACKGROUND ART

Information storage terminals such as a digital camera and information output apparatuses such as a printer are conventionally peripheral devices for personal computers (PCs). Data of such peripheral device is loaded to a PC, processed, and then output.

However, not everyone can handle a PC, so a "direct print" method of directly connecting a digital camera and printer via a cable to print is proposed (see, e.g., Japanese Patent Laid-Open No. 11-239312).

In recent years, wireless LANs defined by IEEE 802.11 has spread. The wireless LAN can wirelessly connect a computer and network at high speed.

In this situation, the direct print method also requires wireless connection instead of cumbersome cable connection. Wireless connection by a wireless LAN defined by IEEE 802.11 has become popular and can

be implemented at relatively low cost. Wireless connection can connect a peripheral device and digital camera, and can also easily connect a digital camera to the Internet.

5 When the IEEE 802.11 wireless LAN is applied to a computer, the user can designate a wireless network to be connected by using its identifier. For a user who uses direct printing, wireless connection by simple operation is desirable because the operation unit of a
10 digital camera or printer has poor operability.

 Several parameters must be essentially set for wireless connection. The IEEE 802.11 wireless LAN can establish wireless connection by receiving a wireless network identifier contained in a beacon frame
15 periodically transmitted from an access point, and using the received wireless network identifier for wireless connection, without setting any parameter. The wireless LAN enables the user to attain wireless connection without any special operation.

20 However, wireless connection suffers the following problems:

(1) A direct print type printer does not always exist in a connected wireless network; and

(2) In order to solve problem (1), the user may
25 be prompted to input various pieces of information or perform various operations. However, a wireless connection cannot be realized by simple operation.

DISCLOSURE OF INVENTION

The present invention has been made to overcome the conventional drawbacks, and has as its object to wirelessly connect an information processing apparatus having a function of performing predetermined processing.

To achieve the above object, according to one aspect of the present invention, it is provided that a connection control method for an information processing apparatus, comprising: a step of receiving identification information for identifying each network out of a plurality of wireless networks; a step of wirelessly connecting a wireless network identified by arbitrary identification information; a step of inquiring, of other information processing apparatuses in the wirelessly connected wireless network, whether the other information processing apparatuses have a function of performing predetermined processing; and a step of controlling connection to one of the other information processing apparatuses in accordance with a response to the inquiry, wherein the information processing apparatus causes the connected one of the other information processing apparatuses to perform the predetermined processing.

According to another aspect, it is provided that an information processing apparatus comprising: means

for receiving identification information for
identifying each network out of a plurality of wireless
networks; means for wirelessly connecting a wireless
network identified by arbitrary identification
5 information; means for inquiring, of other information
processing apparatuses in the wirelessly connected
wireless network, whether the other information
processing apparatuses have a function of performing
predetermined processing; and means for controlling
10 connection to one of the other information processing
apparatuses in accordance with a response to the
inquiry, wherein the information processing apparatus
causes the connected one of the other information
processing apparatuses to perform the predetermined
15 processing.

Other features and advantages of the present
invention will be apparent from the following
description taken in conjunction with the accompanying
drawings, in which like reference characters designate
20 the same or similar parts throughout the figures
thereof.

BRIEF DESCRIPTION OF DRAWINGS

The accompanying drawings, which are incorporated
25 in and constitute a part of the specification,
illustrate embodiments of the invention and, together

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with the description, serve to explain the principles of the invention.

Fig. 1 is a view showing the arrangement of a wireless LAN system according to the first embodiment;

5 Fig. 2 is a block diagram showing the functional arrangement of a wireless communication digital camera;

Fig. 3 is a chart showing a sequence according to the first embodiment;

10 Fig. 4 is a flow chart showing processing by a WDSC according to the first embodiment;

Fig. 5 is a chart showing a sequence according to the second embodiment;

Fig. 6 is a flow chart showing processing by a WDSC according to the second embodiment;

15 Fig. 7 is a table showing an OK message reception list according to the second embodiment;

Fig. 8 is a table showing a state in which the OK message reception list shown in Fig. 7 is updated;

20 Fig. 9 is a view showing the arrangement of a wireless LAN system according to the third embodiment; and

Fig. 10 is a chart showing a sequence according to the third embodiment.

25 BEST MODE FOR CARRYING OUT THE INVENTION

Preferred embodiments of the present invention will be described in detail below with reference to the

accompanying drawings.

[First Embodiment]

A case wherein wireless direct printing is performed by a wireless direct print type digital camera (to be referred to as a WDSC hereinafter) and a wireless direct print type printer (to be referred to as a WPTR hereinafter) will be described as the first embodiment. In this embodiment, the wireless standard is a wireless LAN, and the WDSC and WPTR operate as stations (to be referred to as STAs hereinafter). The communication mode is an infrastructure mode defined by IEEE 802.11.

Fig. 1 is a view showing the arrangement of a wireless LAN system according to the first embodiment. In the system shown in Fig. 1, the wireless LAN has two access points (to be hereinafter referred to as APs), i.e., APs 110 and 111. The APs 110 and 111 have wireless areas 120 and 121, respectively, and can wirelessly communicate with STAs within the areas. That is, the AP 110 communicates with an STA 102 serving as a WPTR, whereas the AP 111 communicates with STAs 103 and 104 serving as WPTRs. The WDSC is illustrated as an STA 101 in the example shown in Fig. 1, and exists within the wireless areas of the APs 110 and 111.

In the first embodiment, the printer suffices to be one corresponding to IEEE 802.11 wireless direct

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printing, and a detailed description thereof will be omitted.

The arrangement and operation of a wireless direct print type digital camera which wirelessly connects the WPTR by simple operation will be explained.

Fig. 2 is a block diagram showing the functional arrangement of a wireless communication digital camera. In Fig. 2, reference numeral 201 denotes a wireless transmission/reception unit which modulates a digital signal to be transmitted in order to wirelessly transmit it, converts the modulated transmission data into a wireless transmittable form to transmit the data to an antenna, extracts modulated data from information wirelessly received from the antenna, detects the received signal, and converts the signal into a digital signal. Reference numeral 202 denotes a memory unit which stores a video signal sensed by a digital camera processing unit (to be described below), setting information, and the like.

Reference numeral 203 denotes a digital camera processing unit which includes an image sensing unit for converting an image of an object optically sensed by a CCD into an electrical signal and outputting the electrical signal, and performs predetermined processing for a video signal output from the image sensing unit. Reference numeral 204 denotes a

timepiece unit which counts various setting times by a programmable timer. Reference numeral 205 denotes a control unit including a CPU which controls the overall digital camera in accordance with a program (to be
5 described later), a ROM which stores the program and control data of the CPU, and a RAM which defines a work area, various tables, and the like used to execute processing by the CPU.

Processing in the first embodiment will be
10 explained in which in order to print by direct printing from the WDSC (STA 101 shown in Fig. 1), a wireless link is established, and then a print processing request is issued to a WPTR which has responded to a print function inquiry.

15 Fig. 3 is a chart showing a sequence according to the first embodiment. Fig. 4 is a flow chart showing processing by the WDSC according to the first embodiment.

The control unit 205 of the STA 101 serving as a
20 WDSC set in the infrastructure mode activates the beacon reception timer of the timepiece unit 204 (301). The control unit 205 performs scanning (302), and receives beacon signals (303 and 304) sent from the APs 110 and 111 until the beacon reception timer reaches
25 the expiration time (305) (S401). An SSID (Service Set Identifier) which is contained in the received beacon signal and set to identify an access point (network) is

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read, and the read SSID is stored in the memory unit 202 and set in the control unit 205 (S402). Wireless connection (306) is established via the wireless transmission/reception unit 201. In this case, the
5 first received SSID of the AP 110 is set.

If wireless connection to the AP 110 fails (NO in S403), whether another SSID exists in the memory unit 202 is confirmed (S404). If another SSID exists (YES in S404), the SSID is set in the control unit 205
10 (S402). If no SSID can be confirmed (NO in S404), the flow returns to step S401 to receive a beacon signal again. Before the next reception, a non-service-area timer may be activated to set a reception interval.

If wireless connection is successful (YES in S403), a print function inquiry message (308 and 309) which inquires whether an STA corresponds to direct printing is transmitted to all STAs (STA 102 shown in Fig. 1) in the network identified by the set SSID (S405). The response time timer of the timepiece unit
20 204 is activated (307). In this case, an NG message (310 and 311) is received from the STA 102 serving as a WPTR because of a different direct print version.

When the STA is not a WPTR (i.e., the STA does not correspond to wireless direct printing), unlike the
25 first embodiment, no response can be expected, and processing waits for the response time of the response time timer, and if no response is received, an NG

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message is assumed to be received.

If the response time timer reaches the expiration time (312), reception of a response message to the print function inquiry message stops (NO in S406), and
5 the flow shifts to the next processing. That is, the control unit 205 determines that the presence of a WPTR which satisfies the STA 101 serving as a WDSC cannot be confirmed. A list of SSIDs stored in the memory unit 202 is referred to (YES in S404), the SSID of the next
10 AP 111 is set in the control unit 205 (S402), and wireless connection (313) is performed.

If wireless connection is successful (YES in S403), a print function inquiry message (315, 316, and 317) is similarly transmitted to all STAs (STAs 103 and
15 104 shown in Fig. 1) in the network (S405), and the response time timer of the timepiece unit 204 is activated.

Thereafter, if an OK message (318 and 319) is received from the STA 103 serving as a WPTR (YES in
20 S406), the control unit 205 stops the response time timer (320). In response to this, after the STA 103 transmits the OK message, even if the STA 104 transmits a response message, the STA 101 does not receive it.

The STA 101 which has received the OK message
25 (318 and 319) from the STA 103 serving as a WPTR transmits a print request to the STA 103, and performs print processing (321 and 322) (S407).

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In this manner, the WDSC can be connected to the WPTR having the direct print function, and execute print processing by direct printing.

Wireless direct printing has been explained using
5 a wireless LAN as a wireless method, but can cope with various wireless methods.

[Second Embodiment]

The second embodiment according to the present invention will be described in detail below with
10 reference to the accompanying drawings.

In the first embodiment, a print processing request is issued to a WPTR which has first sent back an "OK message" in response to a print function inquiry when wireless direct printing is performed by a
15 wireless direct print type printer (WPTR) from a wireless direct print type digital camera (WDSC). In the second embodiment, a list of WPTRs which have sent back "OK messages" is created and registered in advance, a desired WPTR is selected, and a print
20 processing request is issued to it.

The arrangement of a wireless LAN system according to the second embodiment is the same as that according to the first embodiment shown in Fig. 1, and a description thereof will be omitted. Similar to the
25 first embodiment, the wireless standard is a wireless LAN, and the WDSC and WPTR operate as STAs.

The arrangement of a wireless direct print type

digital camera (WDSC) is also the same as that in the first embodiment shown in Fig. 2, and a description thereof will be omitted.

Processing in the second embodiment will be explained in which in order to print by direct printing from a WDSC (STA 101 shown in Fig. 1), a wireless link is established, a list of WPTRs which have responded to a print function inquiry is created and registered, and a print processing request is issued to a desired WPTR. This processing also includes processing of issuing a print processing request to another WPTR in the registered list when print processing does not normally end.

Fig. 5 is a chart showing a sequence according to the second embodiment. Fig. 6 is a flow chart showing processing by the WDSC according to the second embodiment.

A control unit 205 of the STA 101 serving as a WDSC activates the beacon reception timer of a timepiece unit 204 (501). The control unit 205 performs scanning (502), and receives beacon signals (503 and 504) sent from APs 110 and 111 until the beacon reception timer reaches the expiration time (505) (S601). An SSID which is contained in the received beacon signal and set to identify a network is read, and the read SSID is stored in a memory unit 202 and set in the control unit 205 (S602). Wireless

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connection (506) is established via a wireless transmission/reception unit 201. In this case, the first received SSID of the AP 110 is set.

If wireless connection to the AP 110 fails (NO in S603), whether another SSID exists in the memory unit 202 is confirmed. If another SSID exists (YES in S604), the SSID is set in the control unit 205 (S602). If no SSID can be confirmed (NO in S604), the flow returns to step S601 to receive a beacon signal again. Before the next reception, a non-service-area timer may be activated to set a reception interval.

If wireless connection is successful (YES in S603), a print function inquiry message (508 and 509) which inquires whether an STA corresponds to direct printing is transmitted to all STAs (STA 102 shown in Fig. 1) in the network identified by the set SSID (S605). The response time timer of the timepiece unit 204 is activated (507). In this case, an NG message (510 and 511) is received from the STA 102 serving as a WPTR because of a different direct print version.

When the STA is not a WPTR, unlike the second embodiment, no response can be expected, and processing waits for the response time of the response time timer, and if no response is received, an NG message is assumed to be received.

If the response time timer reaches the expiration time (512), reception of a response message to the

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print function inquiry message stops (NO in S606), and the flow shifts to the next processing. That is, the control unit 205 determines that the presence of a WPTR which satisfies the STA 101 serving as a WDSC cannot be confirmed. A list of SSIDs stored in the memory unit 202 is referred to (YES in S604), the SSID of the next AP 111 is set in the control unit 205 (S602), and wireless connection (513) is performed.

If wireless connection is successful (YES in S603), a print function inquiry message (515, 516, and 517) is similarly transmitted to all STAs (STAs 103 and 104 shown in Fig. 1) in the network (S605), and the response time timer of the timepiece unit 204 is activated.

If OK messages (518, 519, 520, and 521) are received from the STAs 103 and 104 serving as WPTRs (YES in S606), the control unit 205 stops the response time timer upon the lapse of a predetermined time (522). The control unit 205 writes, in the OK message reception list, the network addresses of the STAs 103 and 104 from which the OK messages have been received, as shown in Fig. 7, and registers the list in the memory unit 202 (S607).

By referring to the OK message reception list registered in the memory unit 202, a print processing request is transmitted to the network address of the STA 103 whose OK message has first been received by the

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STA 101 serving as a WDSC (S608). If printing does not normally end (NO in S609), the control unit 205 refers again to the OK message reception list registered in the memory unit 202 (S610), and writes "NG" in the
5 column for the network address of the STA 103, as shown in Fig. 8. The control unit 205 transmits a print processing request to the network address of the STA 104 to which no "NG" is assigned (S608). If print processing normally ends (YES in S609), the processing
10 ends. At this time, the OK message reception list may be cleared.

As described above, the WDSC can be connected to the WPTR having the direct print function, and execute print processing by direct printing.

15 Wireless direct printing has been explained using a wireless LAN as a wireless method, but can cope with various wireless methods.

[Third Embodiment]

The third embodiment according to the present
20 invention will be described in detail below with reference to the accompanying drawings.

In the first and second embodiments, wireless direct printing is performed by a wireless direct print type printer (WPTR) from a wireless direct print type
25 digital camera (WDSC) via an access point. In the third embodiment, wireless direct printing is done by a wireless direct print type printer having an access

point function.

Fig. 9 is a view showing the arrangement of a wireless LAN system according to the third embodiment. In the system shown in Fig. 9, the wireless LAN has two
5 access points (APs), i.e., APs 910 and 911. The APs 910 and 911 have wireless areas 920 and 921, respectively, and can wirelessly communicate with STAs within the areas. That is, the AP 910 communicates with an STA 902 serving as a WPTR, whereas the AP 911
10 communicates with an STA 903 serving as a WPTR with the access point function. The WDSC is illustrated as an STA 901 in the example shown in Fig. 9, and exists within the wireless areas of the APs 910 and 911. The communication mode is an infrastructure mode defined by
15 IEEE 802.11.

The WPTR having the access point function may be a known one, and a detailed description thereof will be omitted.

The arrangement of the wireless direct print type
20 digital camera (WDSC) is the same as that according to the first and second embodiments shown in Fig. 2, and a description thereof will be omitted.

Processing in the third embodiment will be explained in which in order to print by direct printing
25 from the WDSC (STA 901 shown in Fig. 9), a wireless link is established, and then a print processing request is issued to the AP 911 serving as a WPTR which

has responded to a print function inquiry.

Fig. 10 is a chart showing a sequence according to the third embodiment. Processing by the WDSC in the third embodiment is the same as the flow chart shown in 5 Fig. 4, and will be described with reference to Fig. 4.

A control unit 205 of the STA 901 serving as a WDSC activates the beacon reception timer of a timepiece unit 204 (1001). The control unit 205 performs scanning (1002), and receives beacon signals 10 (1003 and 1004) sent from the APs 910 and 911 until the beacon reception timer reaches the expiration time (1005) (S401). An SSID which is contained in the received beacon signal and set to identify a network is read, and the read SSID is stored in a memory unit 202 and set in the control unit 205 (S402). Wireless 15 connection (1006) is established via a wireless transmission/reception unit 201. In this case, the first received SSID of the AP 910 is set.

If wireless connection to the AP 910 fails (NO in 20 S403), whether another SSID exists in the memory unit 202 is confirmed. If another SSID exists (YES in S404), the SSID is set in the control unit 205 (S402). If no SSID can be confirmed (NO in S404), the flow returns to step S401 to receive a beacon signal again. 25 Before the next reception, a non-service-area timer may be activated to set a reception interval.

If wireless connection is successful (YES in

S403), a print function inquiry message (1008 and 1009) which inquires whether an STA corresponds to direct printing is transmitted to all STAs (STA 902 shown in Fig. 9) in the network identified by the set SSID (S405). The response time timer of the timepiece unit 204 is activated (1007). In this case, an NG message (1010 and 1011) is received from the STA 902 serving as a WPTR because of a different direct print version.

When the STA is not a WPTR, unlike the third embodiment, no response can be expected, and processing waits for the response time of the response time timer, and if no response is received, an NG message is assumed to be received.

If the response time timer reaches the expiration time (1012), reception of a response message to the print function inquiry message stops (NO in S406), and the flow shifts to the next processing. That is, the control unit 205 determines that the presence of a WPTR which satisfies the STA 901 serving as a WDSC cannot be confirmed. A list of SSIDs stored in the memory unit 202 is referred to (YES in S404), the SSID of the next AP 911 is set in the control unit 205 (S402), and wireless connection (1013) is performed.

If wireless connection is successful (YES in S403), a print function inquiry message (1015 and 1016) is similarly transmitted to all STAs (STA 903 shown in Fig. 9) in the network (S405), and the response time

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timer of the timepiece unit 204 is activated.

If an OK message (1017) is received from the AP 911 serving as a WPTR (YES in S406), the control unit 205 stops the response time timer (1018). Accordingly, 5 even if the STA 903 transmits a response message, the STA 901 does not receive it.

The STA 901 which has received the OK message (1017) from the AP 911 serving as a WPTR transmits a print request to the AP 911, and performs print 10 processing (1019) (S407).

In this fashion, the WDSC can be connected to the WPTR having the direct print function, and execute print processing by direct printing.

Wireless direct printing has been explained using 15 a wireless LAN as a wireless method, but can cope with various wireless methods.

In the first to third embodiments, direct printing is realized in an infrastructure mode defined by IEEE 802.11. Direct printing can also be realized 20 using an ad-hoc mode defined by IEEE 802.11.

In this case, the STA 101 serving as a WDSC receives a beacon signal transmitted by an apparatus set in the ad-hoc mode, and reads an SSID. The STA 101 is directly wirelessly connected to the apparatus which 25 has transmitted a beacon signal having this SSID, and inquires by a print function inquiry message whether the apparatus corresponds to direct printing. If the

apparatus does not correspond to direct printing, the STA 101 sets another SSID; if the apparatus corresponds to it, requests the apparatus to print, thereby printing.

5 As described above, according to the above embodiments, the digital camera inquires the presence/absence of the direct print function of printers within a wireless network. If no compatible printer exists, the network is automatically switched,
10 and the digital camera searches for a compatible network in the switched network. Even when a plurality of direct print type printers exist, a print request can be transmitted to a printer exhibiting the highest response speed.

15 The user of the digital camera can access a network including a direct print type printer, and realize direct printing by only simple operation.

 The present invention may be applied to a system including a plurality of devices (e.g., a host computer,
20 interface device, reader, and printer) or an apparatus (e.g., a copying machine or facsimile apparatus) formed from a single device.

 The object of the present invention is also achieved when a recording medium which records software
25 program codes for realizing the functions of the above-described embodiments is supplied to a system or apparatus, and the computer (or the CPU or MPU) of the

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system or apparatus reads out and executes the program codes recorded on the recording medium.

In this case, the program codes read out from the recording medium realize the functions of the
5 above-described embodiments, and the recording medium which records the program codes constitutes the present invention.

The recording medium for supplying the program codes includes a floppy® disk, hard disk, optical disk,
10 magneto-optical disk, CD-ROM, CD-R, magnetic tape, nonvolatile memory card, and ROM.

The functions of the above-described embodiments are realized when the computer executes the readout program codes. Also, the functions of the
15 above-described embodiments are realized when an OS (Operating System) or the like running on the computer performs part or all of actual processing on the basis of the instructions of the program codes.

Furthermore, the present invention includes a
20 case in which, after the program codes read out from the recording medium are written in the memory of a function expansion board inserted into the computer or the memory of a function expansion unit connected to the computer, the CPU of the function expansion board
25 or function expansion unit performs part or all of actual processing on the basis of the instructions of the program codes and thereby realizes the functions of

the above-described embodiments.

As has been described above, according to the
embodiments, an information output apparatus having a
function of connecting an information storage terminal
5 apparatus by simple operation and performing output
processing can be wirelessly connected.

As many apparently widely different embodiments
of the present invention can be made without departing
from the spirit and scope thereof, it is to be
10 understood that the invention is not limited to the
specific embodiments thereof except as defined in the
appended claims.